

REMARKS

Claims 1-19 are pending in the subject application. By the instant amendment, claims 1, 17 and 18 are amended, and claim 15 is cancelled. Claims 1 and 18 are independent.

Applicants appreciate the Examiner's acknowledgement of applicants' claim for foreign priority and receipt of a certified copy of the priority document in parent application Serial No. 09/949,853.

Applicants also appreciate the Examiner's acceptance of the drawings filed on April 14, 2004.

Applicants further appreciate the Examiner's consideration of the Information Disclosure Statement filed on April 14, 2004.

Claims 1-14 and 16-19 are presented to the Examiner for further prosecution on the merits.

A. Introduction

In the outstanding Office action, the Examiner rejected claims 1-12, 15 and 16 under 35 U.S.C. § 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as being obvious over, U.S. Patent No. 5,970,370 to Besser et al. ("the Besser et al. reference"); rejected claim 5 under 35 U.S.C. § 103(a) as being unpatentable over the Besser et al. reference in view of U.S. Patent No. 5,909,059 to Hada et al. ("the Hada et al. reference"); rejected claims 13 and 14 under 35 U.S.C. § 103(a) as being unpatentable over the Besser et al. reference in view of U.S. Patent No. 6,133,109 to Nam ("the Nam reference") and U.S. Patent No. 6,168,992 to Lee ("the Lee reference"); rejected claim 17 under 35 U.S.C. § 103(a) as being unpatentable over the Besser et al. reference and U.S. Patent No. 6,087,250 to Hyakutake et al. ("the Hyakutake et al. reference"); rejected claim 18 under 35 U.S.C. § 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as being

obvious over, the Besser et al. reference; rejected claims 18 and 19 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,316,357 to Lin et al. (“the Lin et al. reference”) and the Besser et al. reference; and rejected claim 19 under 35 U.S.C. § 103(a) as being unpatentable over the Besser et al. reference and further in view of the Lin et al. reference.

B. Asserted Anticipation/Obviousness Rejection of Claims 1-12, 15 and 16

In the outstanding Office action, the Examiner rejected claims 1-12, 15 and 16 under 35 U.S.C. § 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as being obvious over, the Besser et al. reference. Claim 1 is amended by the instant amendment and presently recites,

A semiconductor device having a metal silicide contact structure, comprising:

a silicon-containing substrate having an insulation layer thereon, the insulation layer having an opening that exposes a portion of the silicon-containing substrate;

a metal silicide layer in the opening of the insulation layer and directly on the silicon-containing substrate; and

a silicon-containing conductive layer directly on the metal silicide layer,

wherein the metal silicide layer as a thickness of less than about 100 Å and includes silicon from both the silicon-containing substrate and the silicon-containing conductive layer.

No new matter is introduced by this amendment, and support for the amendment to claim 1 can be found in the application as originally filed at, e.g., page 12, line 20 to page 13, line 3. Applicants also note that claim 15 is cancelled and claim 17 is amended by the instant amendment.

Applicants respectfully submit that the Besser et al. reference fails to disclose, or even suggest, each and every element of claim 1. For example, the Besser et al. reference discloses completely forming a CoSi₂ layer, then subsequently forming a via over the CoSi₂

layer and depositing a material to fill the via.¹ Accordingly, since the CoSi₂ layer is completely formed prior to forming and filling the via, the CoSi₂ layer taught by the Besser et al. reference would not include silicon from the via-filling material, regardless of the presence of silicon in that material.

In view of the above, applicants respectfully submit that claim 1, as well as claims 2-12 and 16 depending therefrom, are neither anticipated by, nor obvious over, the Besser et al. reference. Accordingly, applicants respectfully submit that these claims are allowable over the Besser et al. reference. Therefore, applicants respectfully request that this rejection be reconsidered and withdrawn.

C. Asserted Obviousness Rejections of Claims 5, 13, 14 and 17

In the outstanding Office action, the Examiner rejected claim 5 under 35 U.S.C. § 103(a) as being unpatentable over the Besser et al. reference in view of the Hada et al. reference; rejected claims 13 and 14 under 35 U.S.C. § 103(a) as being unpatentable over the Besser et al. reference in view of the Nam reference and the Lee reference; and rejected claim 17 under 35 U.S.C. § 103(a) as being unpatentable over the Besser et al. reference and the Hyakutake et al. reference. Claims 5, 13, 14 and 17 depend from claim 1. Assuming, *arguendo*, that the proposed combinations of references are proper, applicants respectfully submit that the Hada et al., Nam, Lee and Hyakutake et al. references nonetheless fail to provide the teachings noted above as missing from the Besser et al. reference. Accordingly, applicants respectfully submit that claims 5, 13, 14 and 17 are allowable over the proposed combinations of references, and respectfully request that these rejections be reconsidered and withdrawn.

¹ See the Besser et al. reference at, e.g., col. 7, lines 19-45, and the corresponding illustrations in FIGS. 12-14.

D. Asserted Anticipation/Obviousness Rejection of Claim 18

In the outstanding Office action, the Examiner rejected claim 18 under 35 U.S.C. § 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as being obvious over, the Besser et al. reference. Claim 18 is amended by the instant amendment and presently recites,

A semiconductor device having a metal silicide contact structure, comprising:

a silicon-containing substrate;

a gate oxide film on the silicon-containing substrate;

a gate stack on the gate oxide film, the gate stack including a silicon-containing material at an upper surface of the gate stack;

a metal silicide layer directly on the silicon-containing substrate in a contact area adjacent to the gate stack, and directly on the silicon-containing material of the gate stack; and

a silicon-containing capping layer directly on the metal silicide layer, wherein:

the metal silicide layer has a thickness less than about 100 Å,

the metal silicide layer directly on the silicon-containing substrate includes silicon from both the silicon-containing substrate and the silicon-containing capping layer, and

the metal silicide layer directly on the silicon-containing material of the gate stack includes silicon from both the silicon-containing material of the gate stack and the silicon-containing capping layer.

No new matter is introduced by this amendment, and support for the amendment to claim 18 can be found in the application as originally filed at, e.g., page 20, line 3 to page 22, line 7. Applicants respectfully submit that the Besser et al. reference fails to disclose, or even suggest, each and every element of claim 18, for reasons similar to those set forth above regarding claim 1.

In view of the above, applicants respectfully submit that claim 18 is neither anticipated by, nor obvious over, the Besser et al. reference. Accordingly, applicants respectfully submit that claim 18 is allowable over the Besser et al. reference, and respectfully request that this rejection be reconsidered and withdrawn.

E. Asserted Obviousness Rejection of Claims 18 and 19

In the outstanding Office action, the Examiner rejected claims 18 and 19 under 35 U.S.C. § 103(a) as being unpatentable over the Lin et al. reference and the Besser et al. reference. Claim 18 is amended by the instant amendment. Assuming, *arguendo*, that the proposed combination of the Lin et al. and Besser et al. references is proper, applicants respectfully submit that the Lin et al. and Besser et al. references, whether alone or in combination, nonetheless fail to disclose or suggest each and every element of claim 18.

For example, the Lin et al. reference discloses completely forming a metal silicide by using a laser to anneal a metal layer disposed on a substrate, e.g., a crystalline silicon substrate, and then removing unreacted metal to leave the completed metal silicide structure.² Accordingly, the metal silicide structure is completed prior to the formation of any overlying structures and, thus, the metal silicide structure taught by the Lin et al. reference would not include silicon from the overlying structures, regardless of the presence of silicon in those structures. Similarly, the Besser et al. reference fails to provide the teachings that are missing from the Lin et al. reference, for the reasons set forth above in connection with claim 1.

In view of the above, applicants respectfully submit that claim 18 is not rendered obvious by the proposed combination of the Lin et al. and Besser et al. references. Accordingly, applicants respectfully submit that claim 18 is allowable over the Lin et al. and Besser et al. references, and respectfully request that this rejection be reconsidered and withdrawn.

F. Asserted Obviousness Rejection of Claim 19

In the outstanding Office action, the Examiner rejected claim 19 under 35 U.S.C. § 103(a) as being unpatentable over the Besser et al. reference and further in view of the Lin

² See the Lin et al. reference at, e.g., col. 5, line 34 to col. 6, line 40.

et al. reference. Claim 19 depends from claim 18, and is believed to be allowable for the reasons that claim 18 is allowable. Accordingly, applicants respectfully request that this rejection be reconsidered and withdrawn.

G. Conclusion

The remaining documents cited by the Examiner were not relied on to reject the claims. Therefore, no comments concerning these documents are considered necessary at this time.

If the Examiner believes that additional discussions or information might advance the prosecution of the instant application, the Examiner is invited to contact the undersigned at the telephone number listed below to expedite resolution of any outstanding issues.

In view of the foregoing amendments and remarks, reconsideration of this application is earnestly solicited, and an early and favorable further action upon all the claims is hereby requested.

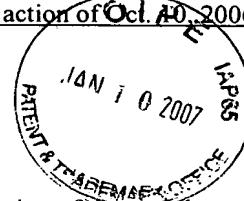
Respectfully submitted,

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PETITION and
DEPOSIT ACCOUNT CHARGE AUTHORIZATION

This document and any concurrently filed papers are believed to be timely. Should any extension of the term be required, applicant hereby petitions the Director for such extension and requests that any applicable petition fee be charged to Deposit Account No. 50-1645.

If fee payment is enclosed, this amount is believed to be correct. However, the Director is hereby authorized to charge any deficiency or credit any overpayment to Deposit Account No. 50-1645.

Any additional fee(s) necessary to effect the proper and timely filing of the accompanying-papers may also be charged to Deposit Account No. 50-1645.